

Spray Polyurethane Foam Roofing

Product overview

Closed-cell spray polyurethane foam (SPF) insulation is a seamless, self-adhering roofing system that has been used since the late 1960's and has a service life of 30+ years. The system bonds to most construction material substrates (i.e. metal, wood, plastic, masonry) and provides a seamless rigid weather barrier and insulation system that also adds structural strength to buildings. It has the highest level of thermal performance per inch for commonly used thermal insulation, with a design R-value of 6.4 for 3-lb roof insulation at a mean temperature of 75°F (ASTM C 518 04).

The product is sprayed directly onto the substrate and expands to nearly 30 times its original volume when applied. It conforms to many irregular spaces and fills voids that other insulation materials leave open. It requires no fasteners, resulting in thermal shorts, and is typically installed in a single application.

Closed-cell SPF roofing has nearly zero air permeability; it is a thermal, air, moisture and vapor barrier.

SPF in roofing applications provides significant energy efficiency benefits due to the high R-value and its unique ability to eliminate thermal bridging and control air movement and moisture transport within the system.

SPF roofing can be applied as a new roof system, or a tear-off and replacement of an existing roof, or as a recover. It provides a weather-tight barrier, can be sloped to help eliminate ponding water and enhance drainage, and can incorporate highly reflective "Cool Roof technologies", utilizing a variety of elastomeric coatings (i.e. acrylic or silicone). SPF roofing systems are lightweight (approx. ½-lb. per sq. ft. on average), making it a frequent choice for tenant improvement and roof recover applications.

As with any other roof system, effective installation and performance of SPF roofing requires thorough inspection of existing conditions, detailed specifications, proper roof surface preparation, regular maintenance, and most importantly, a trained professional contractor for installation. Existing coated SPF roof systems will need to be recoated based on membrane or coating thickness and manufacturer's specifications.

The service life of an SPF roof system is 30+ years, with proper maintenance and recoating.
-National Roofing Foundation

SPF Roofing with Photovoltaic Systems

The U.S. Department of Energy has set targets for residential and commercial buildings to be net-zero by 2020 and 2025, respectively. Such aggressive targets are pushing architects to consider holistic approaches to design and construction to achieve greater building performance. As a result, SPF roofing systems are increasingly being used with solar photovoltaic (PV) systems as part of an integrated energy savings strategy. The Spray Polyurethane Foam Alliance also has industry-level life cycle assessments and environmental impact declarations for SPF insulation, which provide a "big picture" view of environmental impacts, and can earn credit through third party sustainability programs like LEED and GreenGlobes.

SPF roofing is an ideal material to use with solar systems; it is self-flashing when applied, providing an effective seal against any penetrations through the roof substrate. PV panels will add weight to a rooftop, which must be factored into the design and installation. Most SPF roofing systems have a compressive strength of 40-60 psi. Roof systems used as platforms for PV systems must be tough and durable, and generally speaking, SPF has greater compressive strength as density increases. Higher-density SPF systems may be preferred, especially when ballasted support systems are used.

SPF Roofing with Photovoltaic Systems (continued)

In addition to compliance with stricter energy efficiency codes, incorporating solar systems in residential and commercial buildings yields other benefits worth considering:

- Payback for a residential solar panel system now averages 6.9 years.¹
- A 5 kW solar system can save homeowners between \$44 and \$187 per month.²
- Commercial and residential solar systems are eligible for a 30% federal Energy Investment Tax Credit.
- The average 5,000-watt solar system can prevent emission of 300,000 lbs of CO₂.³

SPF Roofing Benefits

Energy Savings

SPF roofing provides a quick return on investment when considering its increased performance and rising energy costs. Texas A&M University studied the energy savings associated with the use of SPF roof systems in buildings on its central campus and determined that the energy savings realized from the system paid back the initial investment within 4.5 years⁴.

Black roofs get hot, with temperatures up to 190° F in summer. Much of this heat is absorbed into the building interior and can significantly impact cooling and heating loads. When used with a light-colored, high-reflectively coating, an SPF roof system can provide 10-20% electricity savings.

Life Cycle Cost

Michelsen Technologies evaluated the lifecycle for SPF roof systems and found that they cost between 10 and 50 percent less than standard built-up-roof, modified-bitumen, and single-ply membrane roof systems over a 30-year time frame (including installation and maintenance and assuming costs based on a 6-, 10- and 15-year re-cover schedule)⁵. The report attributed these savings to:

- Low cost to remove and dispose of existing roof materials
- Energy savings from superior thermal performance and highly reflective SPF roof surfaces
- No damage to be repaired from leaking or moisture
- Minimal comparative maintenance and recoating costs

Waste Reduction

SPF can be applied to an existing roof (after the removal of gravel and dirt), eliminating costly tear-offs and landfill disposals. Even on old roofs with large low areas, additional SPF roofing can fill those areas, promoting proper drainage and eliminating ponding.

Structural Benefits

A new SPF roof adds structural integrity by reducing the flexing of plywood and metal roofs.

Weather Resistance

Major recent hurricanes in the U.S. have proven the real value of SPF as a safe and effective product capable of enduring severe weather better than many other commercially available exterior systems. In separate tests, Underwriters Laboratory and Factory Mutual Global found that SPF re-roofs applied over other roofing materials increased the wind uplift resistance of those roof coverings.

Gouged SPF roofs can continue to perform well without repairs for months without leaking, both during and after storms.

-Roofing Industry Educational Institute

SPF Roofing Benefits (continued)

Urban Heat Island Reduction

Light-colored SPF roof coatings, as part of a cool-roof strategy, have the benefit of reducing the negative environmental impact of commercial buildings by reducing temperatures in urban heat islands (areas 5°F - 8°F hotter than surrounding areas due to heat retention of buildings and hardscapes.) Hot roofs and building surfaces create hot environments, and exacerbate the urban heat island effect, which in turn increases energy costs, decreases occupant comfort, and increases smog. A Lawrence Berkeley National Laboratory's Heat Island Group study calculated potential savings at about \$175 million per year for the 11 cities studied⁶.

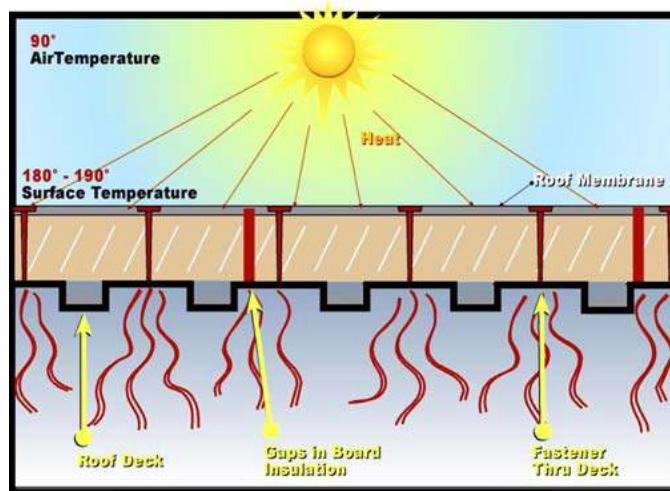
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- 2) NC Clean Energy Technology Center
- 3) <http://solar-power-now.com/environmental-benefits-of-solar/>
- 4) 1984, Energy Performance of SPF Roofing -Gerald Scott, Director of Energy, Texas A&M University
- 5) Life Cycle Cost Analysis Report, Ted Michelsen; Sprayfoam.org
- 6) 1997, Konopacki, S.; Akbari, H.; Pomerantz, M.; Gabersek, S.; and Gartland, L. Cooling Energy Savings Potential of Light-Colored Roofs for Residential and Commercial Buildings in 11 U.S. Metropolitan Areas. LBNL-39433.

General reference: Honeywell Corporation at ccfoam.com.

Typical Insulated Roof

- Thermal shorts from highly conductive fasteners penetrating through the insulation
- Thermal shorts through gaps from one insulation board to the next
- High surface heat from solar absorbent surface membrane



SPF Roof with Reflective Cool Roof Coating

- Continuous, monolithic layer of insulation
- No thermal short from fasteners or gaps
- Reflective coating reduces surface heat by reflecting sunlight
- Equivalent performance to typical insulated roof with thinner insulation

